



A subsidiary of Pinnacle West Capital Corporation

10 CFR 50.73

Palo Verde Nuclear
Generating Station

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102-06187-DCM/FJO
May 06, 2010

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 1
Docket No. STN 50-528
License No. NPF 41
Licensee Event Report 2010-001-00**

Enclosed, please find Licensee Event Report (LER) 50-528/2010-001-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports an automatic actuation of the reactor protection system (reactor trip) subsequent to a loss of a non-class 13.8 kV bus.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the NRC Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact Marianne Webb, Section Leader, Regulatory Affairs, at (623) 393-5730.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

DCM/RAB/TNW/FJO/gt

Enclosure

cc:	E. E. Collins Jr.	NRC Region IV Regional Administrator
	J. R. Hall	NRC NRR Project Manager - (send electronic and paper)
	L. K. Gibson	NRC NRR Project Manager
	R. I. Treadway	NRC Senior Resident Inspector for PVNGS

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LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME
Palo Verde Nuclear Generating Station (PVNGS) Unit 12. DOCKET NUMBER
050005283. PAGE
1 OF 54. TITLE
Automatic Reactor Trip Due to a Loss of a Non-Class 13.8 kV (Calvert) Bus

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	07	2010	2010	- 001 -	00	05	06	2010		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE
1

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)

- | | | | |
|---|---|--|---|
| <input type="checkbox"/> 20.2201(b) | <input type="checkbox"/> 20.2203(a)(3)(i) | <input type="checkbox"/> 50.73(a)(2)(i)(C) | <input type="checkbox"/> 50.73(a)(2)(vii) |
| <input type="checkbox"/> 20.2201(d) | <input type="checkbox"/> 20.2203(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(viii)(A) |
| <input type="checkbox"/> 20.2203(a)(1) | <input type="checkbox"/> 20.2203(a)(4) | <input type="checkbox"/> 50.73(a)(2)(ii)(B) | <input type="checkbox"/> 50.73(a)(2)(viii)(B) |
| <input type="checkbox"/> 20.2203(a)(2)(i) | <input type="checkbox"/> 50.36(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(iii) | <input type="checkbox"/> 50.73(a)(2)(ix)(A) |
| <input type="checkbox"/> 20.2203(a)(2)(ii) | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x) |
| <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2) | <input type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 73.71(a)(4) |
| <input type="checkbox"/> 20.2203(a)(2)(iv) | <input type="checkbox"/> 50.46(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(v)(B) | <input type="checkbox"/> 73.71(a)(5) |
| <input type="checkbox"/> 20.2203(a)(2)(v) | <input type="checkbox"/> 50.73(a)(2)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(C) | <input type="checkbox"/> OTHER |
| <input type="checkbox"/> 20.2203(a)(2)(vi) | <input type="checkbox"/> 50.73(a)(2)(i)(B) | <input type="checkbox"/> 50.73(a)(2)(v)(D) | |

Specify in Abstract below
or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Marianne Webb, Section Leader, Regulatory Affairs

TELEPHONE NUMBER (Include Area Code)

623-393-5730

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	EA	NSBU	C048	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On March 7, 2010, at approximately 1115, Mountain Standard Time, Unit 1 experienced an automatic reactor trip subsequent to a ground fault on a non-class 13.8 kV (Calvert) bus (1E-NAN-A03). The ground fault on 1E-NAN-A03 caused a loss of power to the non-class 13.8 kV bus 1E-NAN-S01. Consequently, two of the four Reactor Coolant Pumps were de-energized resulting in the reactor trip. The Main Feedwater Pump B was manually tripped, and the Auxiliary Feedwater Pump B was manually started. Due to the loss of power on the affected non-class 1E buses, several main turbine and main steam valves failed to close resulting in higher than normal post shutdown steam flow and an undesired Reactor Coolant System (RCS) cooldown. Auxiliary Operators manually closed the affected valves, but cooldown of the RCS continued due to seat leakage of some secondary system valves. The Main Steam Isolation Valves (MSIVs) were closed to mitigate the undesired RCS cooldown. Subsequently, it was determined prudent to cooldown to Mode 5 to establish plant conditions for the bus repair. No automatic engineered safety feature actuations occurred during the event and none were required. All safety-related buses remained energized from normal off-site power during and following the reactor trip.

The bus was taken off-site for evaluation and repair prior to restarting Unit 1 on March 19, 2010. The event investigation revealed the fault was caused by a combination of water intrusion and degraded bus insulation.

In the past three years, Palo Verde Nuclear Generating Station has not reported a similar event where the loss of a non-class power bus due to a bus failure resulted in a reactor trip.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station Unit 1	05000528	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 5
		2010	-- 001	-- 00	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

All times are Mountain Standard Time and approximate unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This Licensee Event Report (LER) is being submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) as an event or condition that resulted in an automatic actuation of the reactor protection system (RPS), a manual system actuation of an Auxiliary Feedwater Pump (AFB-P01), and manual system actuation of multiple Main Steam Isolation Valves (MSIVs). This event was reported to the NRC via the Emergency Notification System (ENS) on March 7, 2010, at 1223 (ENS 45748). The eight hour reporting requirement for the AFB-P01 and MSIV actuations specified in 10 CFR 50.72(b)(3)(iv)(A) was not satisfied.

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

The reactor protection system (RPS) (EIS:JC) consists of sensors, calculators, logic, and other equipment necessary to monitor selected parameters to effect reliable and rapid reactor shutdown (reactor trip). The system's functions are to protect the core specified acceptable fuel design limits and reactor coolant system (RCS) (EIS:AB) pressure boundary for incidents of moderate frequency, and to provide assistance in limiting conditions for certain infrequent events and limiting faults.

The non-class 1E AC system distributes power at 13.8 kV (NA) (EIS:EA), 4.16 kV (NB) (EIS:EA), and 480V (NG, NH) (EIS:EC, ED) for non-safety-related loads. During normal plant operation, power for the on-site non-class 1E AC system is supplied through the unit auxiliary transformer connected to the generator isolated phase bus. Off-site power is provided through the 13.8 kV 1E-NAN-S03B breaker through 13.8 kV (Calvert) bus 1E-NAN-A03 to 13.8 kV bus 1E-NAN-S01. The 1E-NAN-S01 non-class 1E 13.8 kV bus distributes power to:

- 2 - Reactor Coolant Pumps (RCPs) (RC) (EIS:AB)
- 2 - Circulating Water Pumps (CW) (EIS:KE)
- 13 - 480V Load Centers
- 1 - 4.16 kV bus (1E-NBN-S01)

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

3. INITIAL PLANT CONDITIONS:

Palo Verde Unit 1 was in Operating Mode 1 (Power Operations) at approximately 100 percent thermal power at the initiation of this event. There were no major structures, systems, or components that were inoperable at the start of the event that contributed to the event.

4. EVENT DESCRIPTION:

On March 7, 2010, Unit 1 was operating at 100 percent power and local weather conditions included heavy rains and wind gusts up to 40 mph. Unit 1 experienced a plant trip at 1115 when a ground fault occurred on the non-class Calvert bus 1E-NAN-A03 connecting the non-class 1E 13.8 kV bus, 1E-NAN-S01, to breaker 1E-NAN-S03B. The fault propagated from phase A to phase B of the Calvert bus. Protective relays on 1E-NAN-S01 and 1E-NBN-S01 de-energized the buses. The loss of 1E-NAN-S01 de-energized RCPs 1A and 2A resulting in a reactor trip. The loss of 1E-NBN-S01 de-energized Condensate Pumps P01A and P01B.

The loss of two of the three normally operating Condensate Pumps caused a low Condensate System discharge pressure resulting in low suction pressure for both Main Feedwater Pumps (MFWPs). This condition resulted in a low discharge pressure for the Main Feedwater System and the temporary interruption of feedwater flow to the steam generators. Plant stabilization required manually tripping one MFWP and starting AFB-P01 at 1122.

Due to the loss of power on the affected non-class 1E buses, some main turbine and main steam system valves failed to close resulting in higher than normal post shutdown steam flow. This higher than normal post shutdown steam flow resulted in an undesired RCS cooldown as plant conditions necessary for repair of the damaged bus had not been determined. After Auxiliary Operators manually closed the affected valves, further cooldown of the RCS occurred due to seat leakage of some secondary system valves. Therefore, the MSIVs were manually closed at 1456 to mitigate the undesired RCS cooldown. After evaluation, it was determined prudent to cool the plant down to Mode 5 for the bus repair.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

The non-class 1E buses are not required to achieve safe shutdown of the plant or mitigate the consequences of an accident.

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The Main Feedwater System and the Main Steam Isolation System were affected by the event. The Control Room staff initiated Auxiliary Feedwater flow to both steam generators and the steam generators were isolated by closing the MSIVs. The heat removal function was maintained through the Atmospheric Dump Valves until the unit was in Mode 5.

The event did not result in a transient more severe than those previously analyzed in the PVNGS UFSAR, Chapter 15, Accident Analysis. The specified acceptable fuel design limits and RCS pressure boundary limit were not exceeded. No automatic engineered safety feature (ESF) actuations occurred during the event and none were required. All safety-related buses remained energized from normal off-site power during and following the reactor trip.

There were no actual safety consequences as a result of this condition. The condition would not have prevented the fulfillment of the safety function; and, the condition did not result in a safety system functional failure as described by 10 CFR 50.73 (a)(2)(v).

6. CAUSE OF THE EVENT:

The control and maintenance of the installed configuration for 1E-NAN-A03 was not adequate to ensure a weather tight bus duct and adequate Noryl insulation resistance. The bus utilized Noryl sleeve insulation over the conductors, which has been identified through industry operating experience to fail. Additionally, there was evidence of water intrusion in the outdoor vertical section of 1E-NAN-A03. A combination of the water intrusion and the likely degradation of the Noryl insulation resulted in a ground fault on phase A, which then ionized the air inside 1E-NAN-A03, resulting in a phase A to B fault that was then interrupted by bus protective relays.

7. CORRECTIVE ACTIONS:

Immediately following the event, the damaged section of 1E-NAN-A03 was removed and sent to an off-site vendor for repair. An initial extent of condition review was conducted on 13.8 kV Calvert buses that use Noryl insulation and are in an outdoor environment. Each of the three units has two applicable buses, (x)E-NAN-A03 and (x)E-NAN-A04. Two of the six buses (Unit 1, 1E-NAN-A04 and Unit 2, 2E-NAN-A04) were determined not to have had the Noryl insulation repaired or replaced. Visual examinations were performed for these two bus ducts to confirm the ducts were weather tight.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

The following additional corrective actions will be implemented for all three units:

- Improve the inspection and cleaning instructions in the preventative maintenance tasks for the Calvert buses and their associated ducts.
- Replace 13.8 kV outdoor Calvert bus Noryl insulation with new 3M heat shrink insulation or equivalent for the two buses that have not yet had the insulation replaced.

8. PREVIOUS SIMILAR EVENTS:

In the past three years, Palo Verde Nuclear Generating Station has not reported a similar event where the loss of a non-class power bus due to a bus failure resulted in a reactor trip.